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AN ATTEMPT TO ASCERTAIN THE NATURE AND CAUSE OF THE PULSE, IN A STATE OF HEALTH;

As far as it depends upon the Contractile Power OF THE HEART AND ARTERIES, AND THE MECHANICAL EFFECT OF THE BLOOD, BY DISTENSION.

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ABINGDON, BERKS.

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DEDICATED TO T. ARMIGER, ESQUIRE.

Surgeon of Aldermary Church Yard;

AND W. BLIZARD, ESQUIRE.

Surgeon to the London Hoſpital.

GENTLEMEN,

I Cannot expect to add to your reputation by any production of mine, I ſhall think myſelf fortunate if it does me any credit; but of this I am certain, it will afford me an heart-felf ſatisfaction in having an opportunity, thus publickly to acknowledge the great obligations that I feel myſelf under to you, for the beſt part of my profeſſional information, during ſome of the happieſt years in my life, while under your good care and tuition; and as a particular teſtimony of gratitude and eſteem, I beg the following may be inſcribed, by

GENTLEMEN,

Yours moſt reſpectfully,

J. RUMBALL.

Abingdon, February 19, 1796.

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THE following has laid by me ſeven years in manuſcript, during which time I have ſometimes wiſhed, and often been adviſed, to make it public; but, like Mr. Gibbon, I ſoon became tired of ſhewing it to friends; for, as he obſerves, one will condemn where there are no faults, merely to prove his ſenſe; and another will flatter where there are, under pretence of ſhewing his friendſhip, though this is certainly the moſt unfriendly of the two; and therefore, perhaps, if an Author could diveſt himſelf of ſelf, he would often be found to be the beſt judge of his own work, merely becauſe he has ſtudied it moſt.

Under theſe circumſtances I felt a want of ſufficient confidence to publiſh, fearing that I might loſe more in the opinion of the public, than I ſhould gain in private, till at laſt I was determined, by a combination of circumſtances, ſuch as follow, viz.

FIRST, Becauſe moſt that has been ſaid upon this ſubject by others, has related chiefly to the unhealthy Pulſe, which I think can never be perfectly underſtood till we are well acquainted with the nature and cauſe of the ſame in a ſtate of health.

SECONDLY, Becauſe my ideas ſeem to accord with thoſe of a man* whoſe writings are very juſtly ſaid to have "ſo far influenced opinion, in one way or other, "as to affect almoſt the whole practice of medicine in "Great Britain."

And, THIRDLY, Becauſe I know that ſome of the happieſt diſcoveries have been made, even by the errors of the leſs informed, in their reſearches after truth; and this ſhould certainly ſtimulate even the moſt ignorant; becauſe, as Dr. Beddoes obſerves†, "if we can but "perceive enough to ſuggeſt a new hypotheſis, capable "of being verified by experiment, Phyſiology will not "fail to gain ſomething, and perhaps ſomething conſi-"derable, even by the proof of its falſehood. And "this reflection ſhould teach us to ſet a due value on "our preſent knowledge, although it be imperfect; "and it ſhould alſo reſtrain thoſe rude hands that are "ever ready to pluck up the tender plants of ſcience, "merely becauſe they do not bear fruit at a ſeaſon "when they can only be expected to be putting forth "their bloom."

The wiſdom and experience of threeſcore can hardly be expected at thirty; and if a man uſes his beſt endeavours to cultivate information, he is certainly entitled to the indulgence of a generous public.

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* Dr. Brown.

† Vide Beddoes's edition of Brown's Elements of Medicine, which is the work that I always allude to in the following pages.

Dr. Heberden has obſerved, very truly, "that all who "begin the ſtudy of Phyſic, muſt find in the Doctrine "of the Pulſe, as collected from medical writers, a "great deal which they do not underſtand; and all I "imagine who have advanced a little in the practice of "Phyſic, can have very little doubt of its not being "fully underſtood by the authors themſelves; the diſ-"tinctions have been ſo minute, and of ſo little impor-"tance, that moſt of theſe names of Pulſes are now as "unheard of in practice, as if they had never been "uſed; and many of thoſe that are retained ſeem to be "but ſo imperfectly underſtood, that practitioners have "as often deceived as directed each other. It is ſome "ſatisfaction, however, that there is one circumſtance "belonging to the Doctrine of the Pulſe, in which they "could neither miſtake or be miſunderſtood, i. e. the "frequency or celerity of the Pulſe, which is capable "of being numbered, and conſequently, not ſo liable "to be miſunderſtood, as the power or firmneſs of "the ſame."

The Tactus Eruditus is a very deſirable acquiſition, and hard to be obtained; but perhaps there is no caſe in which mankind are more likely to ſuffer, or can ſuffer more from medical miſconception, than from a deception of that ſenſe when applied to the Pulſe.

The ſtate of the Pulſe is generally one of the firſt, and ſometimes the principal circumſtance that is attended to by a medical practitioner; and *then* I often think that it has too much influence upon his opinion.

It is my preſent intention, therefore, to explain the nature and cauſe of the Pulſe in a ſtate of health, as far as it depends upon the contractile power of the Heart and Arteries, and the mechanical effect of the blood by Diſtenſion. And in proportion as we can add to the number of eſtabliſhed facts, I truſt the myſtery of Phyſic, and the uncertainty of practice will be abated; but I beg to offer my opinion with the greateſt diffidence, and declare myſelf open to conviction; that where I am wrong I wiſh to be ſet right, and then I am ſure that I have more to hope than to fear; becauſe if I add to the knowledge of others, my wiſhes are accompliſhed; and if I can derive the leaſt information from them, I ſhall think myſelf amply paid for my trouble.

AN ATTEMPT TO ASCERTAIN THE NATURE AND CAUSE OF THE PULSE IN THE HUMAN FRAME, AS FAR AS IT DEPENDS UPON THE CONTRACTILE POWER OF THE HEART AND ARTERIES, AND THE MECHANICAL EFFECT OF THE BLOOD BY DISTENSION.

FOR this purpoſe, I ſhall conſider the Body as a compoſition of Animal Matter, conſiſting chiefly of Solids, or bundles of moving Fibres, called Muſcles, (the Bones, as only requiſite to ſupport and protect the ſoft Parts, and to ſerve for the attachment of thoſe muſcles as levers for them to act upon) and an adequate proportion of circulating Fluids; amongſt which, Blood ſtands the firſt, becauſe moſt of the reſt are ſeparated from it. That a perfection of Health in the ſame, depends upon a due degree of *Power* in the one, and *Motion* in the other, ſo as to ſupport a juſt equilibrium between the two.

By the word Pulſe, is meant the Salient Motion of the Blood, through the whole arterial ſyſtem, firſt produced by the power of the Heart, and continued through the Arteries by their correſpondent Muſcular Action, till it comes to the Veins, which differ from the Arteries, inaſmuch as they have no muſcular coat, and conſequently can have no Pulſation; they are therefore ſupplied with Valves, by the beautiful ſtructure of which, the Blood is carried on in a uniform ſteady motion, till it is returned to the Heart, and thus the circulation is compleat.

Haller*, ſpeaking of the Pulſe, ſays, "This "being the proper or characteriſtic action "of life, reſults from the Heart, and is in "nowiſe natural to the Arteries left to them"ſelves. Hence when the motion of the Heart "is intercepted, whether by aneuriſm, liga"ture, or otherwiſe, there is no Pulſation of "the Arteries to be felt; and hence there is a "ſudden ceſſation of the Pulſe, by a wound "through the Heart of a living animal, but the

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* Hall. Phys. vol. 2. c. 7. p. 92. Eng. Tr.

“ Artery is proportionably more dilated, as the wave of Blood flows on before more ſlowly, and the more the Velocity of the new wave exceeds that of the former one. The Dilatation of the Heart, is called the Diastole, which is immediately followed by the Systole, or contraction of the ſame; and the Heart having emptied itself, and removed the ſtimulus of the Blood, comes into a ſtate of Relaxation and Reſt. But the Artery at this ſame time, by its innate elaſticity and contractile power reſiding in its circular fibres, irritated likewiſe by the ſtimulus of the blood, contracts itſelf, and expels as much Blood as ſerved to dilate it beyond its mean or middle diameter; and ſo ſoon as the Artery has freed itſelf from this wave, or culumn of Blood, being no longer ſtimulated by distenſion, it directly collapſes by its own proper contractile force, and is now again ready to

yield

A. The Blood, by its quantity diſtends the Muſcular Fibres of the Veſſels, and this diſtenſion proves the cause of occaſſional contraction; but the Blood diſtends with Mechanical, and the Veſſels reſiſt with vital energy; which

may

" yield to a new wave, or column of Blood,
" ſent into it from the Heart, whence follows
" a repeated Diaſtole. The weight of the
" incumbent Atmosphere, of the Muſcles, and
" fleſhy parts lying above the Artery ; and the
" contractile power of the Veſſel itſelf, make a
" reſiſtance indeed to the Heart, but do not
" leſſen the velocity of the Blood, ſince they
" add as much in the Diaſtole, as they dimin-
" iſh in the Syſtole.

" The force of the Heart weakens as the blood
" goes on, and the contractile power of the
" arteries encreases, becauſe, the thickneſs of
" their coat, or membrane, is greater in propor-
" tion with reſpect to their Diameter, as they

may be in different ſtates with reſpect to their power, either of contracting or relaxing. When the Veſſel is weak, which every part of the Vascular System is, as often as the reſt of the Body is weak, both the contraction and relaxation of each portion of Veſſel is imperfect. The contraction from its ſmallneſs, and the relaxation, from its being more owing to the paſſive ſtate of the Simple, than the active ſtate of the living Fibre, leave betwixt them a large Diameter upon the whole. But in a vigorous ſtate of the whole Syſtem in general, and of that of the Veſſels in particular, the contractions are ſtrong and forcible ; and the relaxations in conſent with the contractions. This ſtate of the Veſſel, inaſmuch as it respects the Muſcular Fibres iscalled its Tone and as far as it respects them as ſimple ſolids, its Denſity.

" grow leſs, and is largeſt in the leaſt of them.

" The Pulse, is therefore the meaſure of the
" powers which the Heart ſpends on the blood;
" becauſe, it is the immediate and full effect of
" thoſe powers. Hence, all other things being
" alike, the Pulse is ſlow in the moſt healthy
" People, where there is no Stimulus, or any
" unnatural reſistance to cauſe the effect of a
" Stimulus, but the Heart is at liberty to ſend
" forward the Blood with Eaſe.

There might be much more ſaid upon this ſubject, but the Circulation, is a proceſs now ſo well underſtood by all medical Men, as to render a more minute deſcription of it here unneceſſary.

Any particular alteration in the Pulse, (eſpecially if it be ſudden) is generally allowed to be one of the firſt Symptoms of Diſease, and conſequently one of the firſt circumſtances that

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B. It is very well known (in the cure of Aneurism Particularly) that the ſmalleſt Anaſtamoſing Veſſels, will ſupply the place of the larger branches, in case of Obliteration, with the greateſt degree of perfection ; but this is the leſs to be wondered at, when we conſider, that a ſection even of the largeſt Trunk, is by no means equal to the conjugate Diameter of all its Branches.

is attended to by moſt Phyſicians; and yet perhaps the nature and cauſe of that Pulse, is as differently underſtood by different Perſons, as any one ſymptom that ever attends Diſease. The cauſe of which confuſion, ſeems chiefly to be owing to the undiſtinguiſhed appellations of the ſeveral Pulses, that are made use of by different Noſologiſts, which ſeem to be ſtill encreaſing without end, or advantage; and the pretended ſubtle diſtinctions, that are attempted by various Authors, (the French in particular) that can only tend to puzzle, and miſlead the young Practitioner, rather than inform, or direct him.

Ex. Gr.

In a late Tranſlation of Haller's Phyſiology. we have a paſſage runs thus. † " A frequent " Pulse is different from a ſwift one; and it is " poſsible for the Pulse to be ſwift and unfre- " quent at the ſame time; but it is difficult to " obſerve a ſwift Pulse, becauſe the frequent " Pulse, is what is commonly called a ſwift " one, it takes place in children, and becomes " afterwards ſlower as they grow older.

I think this could not have been accompanied with too minute an explanation, tho' there are certainly many apparently trifling circumſtances, that will contribute very much whether ſeparate, or combined, to effect a variation in the ſame Pulse, independent of every morbid Stimulus; of which perhaps the following are not among the leaſt.

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† Vol. 2. Chap. 7. P. 99.

I. The poſition of the Arm, which ſhould always be ſupported when the Pulse is felt; for if the Patient holds out his arm himſelf, as is generally the caſe, the intervening muſcular tendons &c. in the wriſt, being then in a ſtate of extenſion, will tranſmit a very different ſtroke (like a chord that is ſtrung) from what you will feel, when the muſcles are relaxed, the Arm inclined in an eaſy poſition, and ſupported by any thing but the power of its own Muſcles.

II. The quantity of Muſcle, and integuments, that intervene the Pulse, and the finger, will render the ſituation of the Veſſel more or leſs ſuperficial; and therefore ſhould always be taken into conſideration, becauſe the greater the diſtance, the leſs ſenſibly will pulſation be felt, and vice versa.

III. The degree of preſſure with which the Finger is applied, will have a very conſiderable effect, as I well know from experience; for, I have often found a Pulse, which upon a gentle application of the Finger, appeared to be ſoft and feeble, prove almoſt the reverſe upon preſſing it firmly; and therefore, I would always recommend to practice a ſufficient modification of preſſure.

IV. That the Paſſions of the Mind will affect the Pulse, is well known to all. But this is moſt evident in Children, whoſe Pulſes will often be very much agitated by the attention of a Medical Man, the object of whoſe viſit, they do not always fully comprehend; it has therefore, been very properly adviſed to feel the Pulse of Children when aſleep, eſpecially if very young Children.

The effects of Repletion and Inanition, of Chymical Stimuli, taken internally, ſuch as Cordials, Spirits &c. (of exerciſe, from the Compreſsion of adjacent Muſcles) As well as the external ſtimulus of the Atmoſphere, when the temperature of the ſame runs into the extremes either of Heat or Cold, will produce an effect differing in degree as well in proportion to the quantity, as the ſuddenneſs with which they are applied ; and there has been obſerved to be a material difference in the Pulse, as far as it depends upon what is called temperament, let the age, ſex, or ſtate of mind be what it would.

As to the names, and number of the different Pulſes that occur in diſease, they are certainly very numerous, and can only be fully underſtood by a familiar acquaintance with the natural healthy Pulse. A perfect knowledge of which is abſolutely neceſsary to account for every morbid variation in the ſame, with any tolerable degree of ſatisfaction. I ſhall therefore content myſelf with conſidering the nature, and cauſe of thoſe Pulſes only, which may exiſt during health (or the leaſt deviation therefrom, where the ſum total of indiſposition does not amount to the meaſure of actual diſease) as far as they ſeem to depend upon the muſcular power of the Heart and arteries, and the mechanical power of the Blood; and then cœteris paribus, I think the names and number of every healthy Pulſe, will be much reduced, and may be fully comprized under the following heads. viz.

1 Pulſus ~~Durus~~ or firm pulse. | 2 Pulſus Mollis or ſoft pulse.
3 --- frequens, or quick --- | 4 --- Tardus, or ſlow ---
5 --- Plenus, or full --- | 6 ---Debilis, weak or feeble

The cauſes of which ~~are~~ (here to be conſidered)
re the contractile power of the heart and arteries, and the mechanical power of the Blood by distension ; producing their different effects (with the aſſiſtance of reſpiration &c.&c.) either by

An encreaſed power of the Solids, † and a diminiſhed motion of the Blood,
or,
A diminiſhed power of the Solids, and an encreaſed motion of the Blood.

Now it may appear rather ſtrange prima facie, that two ſuch different ſtates of the body can exiſt during Health ; and the more so, becauſe the very expreſsions of diminiſhed and encreaſed* ſeem to indicate ſomething morbid, or a deviation from the regular ſtandard point, of a healthy middle aged Adult ; but by a common law in mechanics, given by Sir. Isaac Newton, " THAT WHATEVER IS GAINED IN POWER, IS LOST IN

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† By Solids, is meant the heart, and arterial ſyſtem.

* The words Encreaſed and diminiſhed, are to be conſidered as comparative, terms as far as they relate to each other.

TIME." and vice verſa; ſo are the ſolids and fluids, of the human frame, found to regulate each other in ſuch due proportion, as to preſerve an equilibrium between the two; and the cauſe of theſe variations in Health, will be found to depend upon different circumſtances, but chiefly in proportion to the various degrees of quality and quantity, both of our *Diet* and *Exerciſe*; and as Mankind are ſeldom found carefull enough to pay that attention to their Health, which the delicacy of that bleſſing requires, it is a chance of more than ten to one, if from a total inattention to the non-naturals, they do not err in ſome one of theſe particulars, so as at times to produce an alteration, either in the power of the ſolids, or the motion of the fluids, or both; eſpecially as the one depends so much on the other; becauſe as is the quantity or column of Blood, so will be its velocity, in an inverſe proportion to the momentum thereof; that is the greater the quantity, the leſs the velocity, and vice versa. Notwithſtanding which, "so wonderfully are we made, " as the Pſalmiſt beautifully expreſses it, that till this equilibrium

is

deſtroyed, health will ſtill exiſt, nor can diſease take place. As to its quality, the actions of the heart and arteries, will variouſly affect the circulating fluid, as they are performed with more or leſs elaſticity and ſtrength; it is chiefly to theſe that we are indebted for the converſion of chyle into blood, and this will vary in its denſity or principles, according to the degree of power with which they perform their office; and as the circulation is carried on with more or leſs vigour, so will craſsamentum abound in proportion to the ſerous parts.

POS. I. OR AN ENCREASED POWER OF THE SOLIDS; AND DIMINISHED MOTION OF THE BLOOD.

Suppoſe the health of a middle aged Adult, to be the ſtandard point, and the range of the Pulse from about 60 to 80, in a minute; if ſuch a Man enjoys a generous diet, and uſes a proportionate degree of exerciſe, he will ſoon abound in blood, from the nouriſhment he receives; by the ſame means the Solids will gain and maintain for a certain length of time, be it more or leſs, a degree of ſtrength and vigour beyond what he would poſſeſs with a ſpare and hardy fare, though both arc equally conſiſtent with good health, and he would thus aquire what I ſhould call an ENCREASED POWER OF THE SOLIDS. Digeſtion and Chylification being then ſpeedily performed, if the Excreta or Secretions and Excretions do not exceed the Ingeſta or quantity taken in, an increaſed quantity of blood will be the conſequence, and a diminiſhed motion of the ſame; and theſe together will afford a firm, full, aud a ſlow Pulse; the encreaſed power of the heart, and the reſiſtance of the arteries, producing the firmneſs thereof; and a manifeſt abundance of blood, the fullneſs and ſlowneſs of the ſame; becauſe the greater the quantity in circulation, the ſooner is a ſufficient diſtenſion of veſſels produced. And this is a habit of body that ſeems to

A large Pulse is formed by a fullneſs of the artery, joined with a ſtrong force of the Heart; a ſmall Pulse by the emptineſs of the artery, and a leſſer wave of Blood ſent from the Heart. A hard Pulse, denotes ſome obſtacle or ſtimulus; or elſe that the hearts force is increaſed with a greater thickneſs of Blood, or a greater rigidity of the Artery, Haller.

correſpond exactly with Dr. Brown's idea of Stenic Diatheſis, ‡ or encreaſe of all the functions, previous to a diſturbance of the ſame, his words are theſe, " The ſeveral parts of the " body are known to be in a ſtate of vigour from " the following marks. viz. The heart and " arteries from the Pulse, the extreme veſſels " on the ſurface of the body from the colour, " all the muſcles from the ſtrength they exert, " the internal ſecretions from the great quantity " of milk and ſemen, the digeſtive organs from " the ſtrong appetites, the power of digeſtion, " the vigour of body, and the manifeſt abun" dance of blood.

POS. II. OR A DIMINISHED POWER OF THE SOLIDS; AND ENCREASED MOTION OF THE BLOOD.

If the degree of exerciſe which a Man takes exceeds in proportion, either the quantity or quality of his nouriſhment, the quantity of blood will be diminiſhed, becauſe there is not wherewith to allow for the unavoidable conſumption thereof; and as the excretions or uſual evacuations depend in a great meaſure upon the Vis a Tergo, in exhalent veſſels, the more that is encreaſed by exerciſe, the ſooner will the Excreta exceed the Ingeſta; in conſequence of which, (as well as from any deficiency of nouriſhment.) the column of blood will be diminiſhed, and the power of the Solids reduced; and this will produce a quick, ſoft, and feeble Pulse; the debility of the heart, not being able to propel the blood to the point of deſtination in the time determined, is obliged to make two inefficient ſtrokes to ſupply the place of one ſufficient Pulſation, and thus is the quickneſs produced; this with the yielding diſposition of the arteries, and a column of blood that is not adequate to produce a ſufficient diſtenſion, will account for the ſoftneſs, and weakneſs of the ſame. And this ſtill anſwers to Dr. Brown's idea of Aſthenia, wherein he ſays, * "The Pulse is weak, ſoft, "ſmall and pretty quick, the ſoftneſs (when it "can be perceived for the ſmallneſs) as well "as the ſmallneſs, is occaſioned by an under "proportion of blood, ariſing during the period

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‡ Par. CLI. Lib. I. Bedd. Tranſlation.

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* Par. CLXXIX.

“ of prediſpoſition, from a ſcantineſs of Animal
“ food and an exceſs in the uſe of vegetables;
“ or from a deficiency of aliment upon the whole
“ whether from one or other of theſe ſources.
“ The cauſe of the weakneſs, and very great
“ quickneſs of the Pulse, is the ſame deficiency
“ of nouriſhment, and an under-proportion of
“ Blood. C. Again in vol. 2. fol. 352. It is in
“ vain to appeal to frequency of the Pulse, as
“ a ſign of an exceſs in the quantity of blood,
“ and of too much vigour, or of any irritation
“ that requires an Antiſthenic plan of cure; for,
“ beſides its hardneſs, if it is not at the ſame time
“ ſtrong and full, it has been often above
“ demonſtrated, that all its celerity depends
“ upon debility and penury of blood.

Again in chap. 1. fol. 171. cccc89. “ The
“ frequency of the Pulse in all ſthenic diſeases
“ is moderate, with that there is conjoined ſome
“ degree of hardneſs, whenever therefore, the
“ Pulse is very quick, it is to be ſuſpected, that
“ the Sthenic Diatheſis has paſſed into the
“ Aſthenic.

C. A ſtrong example of this is often met with in profuſe Hemorrhage, where the pulse is always quick and weak.

Both caſes therefore come to the ſame point. In the firſt poſition, we may ſuppoſe a power of three, operating with a motion of one, for any given time; in the ſecond, a power of one acting with a celerity of motion as three to one, in the ſame ſpace of time; thereby compenſating for it's moderation in degree, and producing the ſame effect, in preſerving the Equilibrium of Health. But there is no rule without an exception, and therefore it now becomes neceſſary to point out the exceptions to the above, of which we have two remarkable inſtances; the one in infancy, and the other in old age; and theſe perhaps cannot be better explained or accounted for, than by a quotation from a very ingenious diſſertation, "De Morbis Cœli, Mutatione Medendis," * whoſe words are theſe, viz. "Ætate puerili, "ubi corpus indies creſcit, major adeſt boni "ſanguinis copia, quam ad corpus nutriendum, "et ſine incremento ſuſtinendum, requiritur; "et hæc quidem vera plethora eſt; attamen "nequaquam morbida. Nam vaſa facile

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* By J. GREGORY, of Edinburg.—Fol. 80.

“ cedunt et dilatantur, donec corpus debitam
“ magnitudinem attigerit; ſed, quum vaſa
“ validiora fiunt, et ſanguini reſiſtunt, tunc
“ plethora ſentitur, et hæmorrhagiæ et varii
“ morbi ex eo oriuntur. Ex obſervationibus
“ et experimentis clariſſimi Wintringhamii
“ junioris conſtat, proportionem denſitatis et
“ roboris inter arterias et venas variam diver-
“ ſis hominum ætatibus obtinere. Ætate
“ puerili, et etiam juvenili, venæ arteriis
“ multo majore vi et denſitate pollent: Ætate
“ provectiori, arteriæ viciſſim majorem vim
“ adipiſcuntur. Debitum æquilibrium circa
“ trigeſimum vel trigeſimum quintum annum
“ obtinere videtur. Hinc, ſi plethora in cor-
“ pore adſit antequam æger trigeſimum attigerit
“ annum, in arteriis tantummodo, vel ſaltem
“ præcipue, ſe oſtendit; quippe venæ, ob
“ majorem denſitatem et robur, nimiæ ſan-
“ guinis copiæ reſiſtere queunt: Arteriæ
“ autem, ob majorem laxitatem et debilitatem,
“ nimiam ſanguinis proportionem accipiunt,
“ ideoque diſtenduntur: Et inde provenit con-
“ geſtio, et a ſubita et violenta aliqua cauſa,

" quæ ſanguinis diſtributionem magnopere " turbat, arteriarum ruptura, et hæmorrhagia. " Sed, poſt annum trigeſimum quintum, hæ- " morrhagiæ plerumque ex venis, raro, ex " arteriis, fiunt." Thus then it appears, that there is the greateſt proportionable quantity of blood in the ſyſtem, during the tendereſt years of childhood, when we have the quickeſt natural Pulſe, as well as the moſt healthy; but this ariſes from the gravity of the fluid, proving ſo far ſuperior to the tone or reſiſtance of the artery, " Arteriæ quia, (antequam æger " trigeſimum attigerit annum) ob majorem " laxitatem et debilitatem, nimiam ſanguinis " proportionem accipiunt, ideoque diſtendun- " tur;"—that notwithſtanding there be an abundance of Blood in circulation, yet from the relative inferiority of power in the veſſel itſelf, its celerity muſt be increaſed, in proportion to its comparative debility. Further, it may frequently happen, nay, I believe I may ſay it often does, that from the common infirmity of human nature, and the feeble exertions of a languid fibre, in the decline of life, when the ſeveral functions of the body are continued but ſlowly and with difficulty, the calls of ſenſe are much abated; digeſtion and chylification imperfectly performed, and the daily ſupport that ſuch a man receives, from his thus dimiſhed ingeſta, is barely ſufficient to repair the unavoidable decays of nature; the power of the ſolids is thereby diminiſhed, and a penury of blood takes place, and yet we have a comparatively ſlow Pulſe; ſlow becauſe, "Ætate provecticri, arteriæ viciſſim majorem "vim adipiſcuntur, itaque, * quum ſyſtema "arterioſum tantam vim acceperit, ut venoſum "ſuperet, plethora, ſiqua in corpore adſit, in "venis præcipue vel ſolummodo ſentitur;" that is, the venal ſyſtem, as far as diſtenſion is concerned, will have the balance in its favor; and the arterial poſſeſſing the balance of power, celerity will be the leſs required.

Thus then have I endeavoured to prove, that theſe powers of the living body are ſubject to the laws of mechanics, wherever they can be

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* Fol. 84.

ſuppoſed to be under the influence of any mechanicle principle; and if there is any truth in the above doctrine, I think the following concluſion may be very fairly drawn from the ſame—i. e. *According to the degree of excitement produced by any ſtimulus, ſo in proportion will be the degree of debility which afterwards enſues,* unleſs there ſhould previouſly exiſt a manifeſt abundance of ſtrength and vigour, ſuperior to the action of the ſame. But then the firſt queſtion is, What is a ſtimulus? in good truth, this is a difficult matter to ſay; for what one man calls a ſtimulus, another calls a ſedative; and a third will not allow any ſuch thing as a ſedative at all. Celſus ſays, "Ars noſtra conjecturalis eſt;" and every man of ſenſe, whether in the profeſſion or not, has always held the ſame ſentiments of it. Nothing can be more glaring than the contradictions in medical writings and reaſoning of every kind. One * maintains the action of opium to be as a potential ſedative, and only as a ſedative. The apparent irritation

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[*] Medical Eſſays and Obſervations by James Johnſon, Worceſter, M. D.

ſometimes ariſing from it, he attributes ſolely to the re-action of the vital powers, reſiſting its proper debilitating and torporic effect. Another * ſays, opium is the ſtrongeſt ſtimulant in nature, and ſo far from bringing on ſleep, it is the moſt powerful body of all others in producing and keeping up the watching ſtate. But, perhaps, there is no one of which they have held a more wavering opinion, than of the effect of cold, with reſpect to which I think that Dr. Cullen's opinion † is well worth every man's attention, becauſe it partly accounts for the difference of ſentiments above ſtated, which is, " That if the natural temperature of the human body is, as we ſuppoſe it to be, that of 98 deg. of Farenheit's thermometer, every degree of temperature leſs than that, may be conſidered as cold with reſpect to the human body, and in proportion to its degree will have a tendency to diminiſh the temperature of the body. But as the living human body has in

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* Dr. Brown, vol. 1. page 253.

† Cullen's firſt lines, vol. 1. page 144.

itſelf a power of generating heat, ſo it can ſuſtain its own proper heat to the degree abovementioned, though ſurrounded by air or other bodies of a lower temperature than itſelf; and it appears from obſervation, that, in this climate, air, or other bodies applied to the living man, do not diminiſh the temperature of his body, unleſs the temperature of the bodies applied be below 62 deg. From hence it appears, that the *abſolute* power of cold, in this climate, does not act upon the living human body, unleſs the cold applied be below the degree juſt now mentioned. It appears alſo, that the human body being ſurrounded by air of a lower temperature than itſelf, is neceſſary to its being retained in its proper temperature of 98 deg. for, in this climate, every temperature of the air above 62 deg. applied to the human body, though ſtill of a lower temperature than itſelf, is found to increaſe the heat of it. Nay if the temperature at any time applied is under 62 deg. every increaſe of the ſame will give a ſenſation of heat; but if the increaſe of temperature does not ariſe to

62 deg. the ſenſation produced will not continue long, but ſoon be changed to a ſenſe of cold; becauſe, agreeable to the general principle of ſenſation, the ſenſation produced is not in proportion to the abſolute force of impreſſion, but according as the new impreſſion is ſtronger or weaker than that which had been applied immediately before; ſo that whatever is higher than this feels warm, and whatever is lower than it feels cold; it will therefore happen that the oppoſite ſenſations of heat and cold may on different occaſions ariſe from the ſame temperature." Conſequently that which proves a ſtimulus to one perſon, may become a ſedative to another; and the ſame temperature which will create a ſenſe of cold at one time, may produce an encreaſe of heat at another, even in the ſame perſon; but this will not depend ſo much upon the intenſity of the power applied, as from the ſudden tranſition from one extreme to the other, the length of time during which it is applied, and the power of the body to reſiſt impreſſion. From all which I am led to conclude, that the Cold

Bath * is often recommended with more haſte than prudence, becauſe cold as well as heat will affect the weak more than the ſtrong, and therefore, if not duly regulated, † is more likely to ſtrengthen the ſtrong, and weaken the weak, than to ſtrengthen the weak only. In ſhort, it is like every other power, which proves a ſalutary ſtimulus to a certain degree, and beyond that becomes a noxious ſedative. Wine for inſtance, if taken in moderation, exhilarates the ſpirits, and enlivens the whole frame; but if uſed in exceſs, it deſtroys both ſenſe and ſtrength, and brings on irreſiſtible ſleep.

Opium the ſame, which will often encreaſe the reſtleſsneſs, &c. when given in ſmall doſes, and as certainly ſettle all, if ſufficiently encreaſed; but then we all know the conſequence, and indeed in moſt caſes, it would be better,

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[*] In my opinion, the obſervations of Dr. Buchan upon Cold Bathing, form the moſt valuable part of his domeſtic medicine.

[†] Nothing can be greater madneſs than for invalids to plunge into the extreme Cold Baths of the Metropolis, without regulating the ſame to their own bodies, by means of a Thermometer.

as Dr. Beddoes very juſtly obſerves, to induce ſleep, by the abſtraction of ſtimuli, rather than by exhauſting the excitability.

Dr. Cullen further aſſerts, that the power of cold, with reſpect to the human body, is very different from what it is with reſpect to inanimate bodies.

In many caſes, perhaps, it may be ſo, but I think there are ſome inſtances in which they will bear a compariſon. ex. gr. I have ſeen an old wine decanter (previouſly heated before the fire) ſuddenly fly to pieces only upon pouring in the cold wine; and the ſame thing happens every day from the ſudden application of heat to a cold glaſs; but this is not owing to the degree of heat, but to the ſuddenneſs of the application, or the vivid tranſition from one extreme to the other, becauſe the ſame glaſs, if gradually heated, (in balneo arenæ) would bear heat enough to boil any fluid.

To theſe ſudden changes then, from one extreme to the other, ſhould I look for the common cauſe of moſt of the coughs, colds, catarrhs, &c. in this variable climate of ours, where we often ſee the Thermometer vary no leſs than 15 or 20 deg. in a few hours. The beſt protection againſt which, is a flannel waiſtcoat next to the ſkin; whereby the body is protected from cold,* and perſpiration prevented from being too ſuddenly checked, which frequently happens with linen, if haſtily expoſed to the influence of cold air, when in a ſtate of profuſe perſpiration; though Dr. Brown ſays, (vol. 1ſt. pag. 296) "that the remarkable effect of cold, when applied to the ſurface of the body in the ſmall-pox, is keeping up freedom of perſpiration in proportion to the degree of its application;"

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* At this day there are greater numbers that die in Britain of Cold, than of all other diſeaſes not originating in Colds put together; and this evil ariſes entirely from a fooliſh pride of ſtrutting about in thoſe thin ſlices of modern manufacture.

The golden fleeces of our ſheep given us by kind nature, to guard us againſt the peculiar inconſtancy of our climate, are fretted away into ſpiders' webs. For my part, I am at no loſs to decide which appears moſt effeminate, to wear a comfortable great coat, or to ſtarve to death under a gauze tippet.——Travels into Norway, Denmark, &c. by A. Swinton, Eſq. fol. 50. and 51.

and Dr. Beddoes tells us,* "that catarrh, (whatever may be the degree of inflamation) never takes place, unleſs we paſs too ſuddenly into a comparatively warm atmoſphere, or apply a ſtimulus equivalent to heat."

That this will have that effect, I am very well perſuaded; † but with all due deference to ſuch reſpectable authority, if that be the only cauſe, how ſhall we account for thoſe complaints which are the immediate conſequence of either man or horſe being ſuddenly expoſed to a cold air, when in a ſtate of profuſe perſpiration; and which the dog as certainly eſcapes, although he daſhes on when overheated by the moſt violent exerciſe, into a degree of cold below the freezing point, only becauſe he does not perſpire?

I maintain, therefore, that whatever be the change, whether from heat to cold, or from cold to heat, the effect will not be ſo much in proportion to the difference in degree, as to the

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[*] Beddoes upon Calcul, &c. fol. 156.

[†] We have a ſtrong proof of this effect in the recovery of a frozen limb, whether animal or vegetable.

ſuddenneſs of the tranſition in deſtroying the equilibrium of health.

With reſpect to Fevers in general, it was Cullen's idea, that it is the weakneſs of reaction which continues the febrile ſymptons; and, indeed, I muſt confeſs myſelf to be of that opinion, with thoſe of the low form; but ſurely it muſt be from an exceſs of it in thoſe of the high,* becauſe as Brown very juſtly obſerves in his preface, "the noxious powers which excite either, are found to be the remedies of the other, and the contrary; and they certainly act in the ſame manner as the powers which produce the muſt perfect health, with only a difference in degree." It has been already demonſtrated, that the weaker the pulſe is, the quicker it is in health; and vice verſa, this will often apply in diſeaſe, and therefore ought to guard us againſt a dangerous error in practice, of treating the weakeſt too freely with the moſt powerful, or as Dr. Brown would ſay, (whoſe diſtinction between the durable and diffuſible cannot be too much attended to) the moſt diffuſible ſtimuli. It is certain, that they are often very proper, if not abſolutely neceſſary, in aſthenic diſeaſes, to make up in time, for what is loſt in power; but I have always found it, and I am much afraid that it will ever remain, a very difficult matter to mark the ne plus ultra; and therefore the more you can ſtrengthen with the durable the better, becauſe the ſooner the diffuſible becomes unneceſſary.

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* Remittent and intermitting Fevers, are both diſtinguiſhed by a cold fit exhibiting manifeſt debility, and a hot fit counterfeiting vigour.—Brown, vol. 2. fol. 291.

A want of attention to this important circumſtance, I really believe has been the death of many thouſands. I ſhall never forget the loſs of one poor fellow whom I recovered from apparent death by drowning, and who was ſtimulated to death in reality, in leſs than four-and-twenty hours afterwards (with cordials, ſpirits, &c.) by his own parents.

I remember being told, by very good authority, that the late ingenious Dr. Walſh, of London, fell a ſacriſice* to the immoderate uſe, or rather abuſe, of brandy, which was preſcribed with the beſt intentions during an aſthenic diſeaſe, brought on by an accident in diſſection; and with him three others in one week; while I recovered from the ſame complaint, the effect of the ſame cauſe, by a determined preference to the uſe of malt liquor, and the durable ſtimuli only. Praiſed be Almighty God for the ſame, with due thanks to Drs. Budd and Nankivell, and Meſſrs. Armiger, Blizard, and Headington, for their very great attention and good inſtructions. It therefore becomes a matter of the firſt conſequence, to appropriate the ſtimulus, or in other words, the excitement to the excitability. But then it is urged, that wine, &c. is uſed chiefly as an antiſeptic; but Brown very juſtly tells us, * "that the ſuppoſed antiſeptics, either have no ſuch property under any circumſtances, or they neither are given, or can be given, in ſuch quantity as to affect the compoſition of the fluids: In fine, the effect of inanimate matters upon each other, can never, with any propriety, be transferred to living ſyſtems. Though then,

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* In the year 1788.

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* Lib. 1. fol. 112.

the fluids are frequently corrupted, the corruption is the effect of weakneſs of the veſſels, which prevents them from being ſufficiently mixed and diffuſed, but it is never the original cauſe of diſeaſe."

In my opinion, therefore, the beſt tonic, is the beſt antiſeptic, and a draught of good bottled malt liquor, which may be ſafely allowed in much larger quantities, will often be preferable to the moſt generous cordial, becauſe the vegetable nouriſhment which it contains, will more than ſupport the action which it induces, without any fear of conſequent debility; and inſtead of increaſing the diſtreſſing heat and thirſt, is much more likely to reſtore the equilibrium between the power of the ſolids and the motion of the fluids, than that ſtimulus which encreaſes the motion only, and thereby tends to diminiſh the power of the living fibre; at leaſt, ſuch as has been my practice hitherto, and it gives me pleaſure to ſay, that I have never had cauſe to repent it.

It now becomes neceſſary to enquire how this ſaid equilibrium, between the ſolids and fluids, is ſupported during health.

This is effected by means of the lymphatic abſorbent ſyſtem; but I ſhall firſt ſay a word or two reſpecting nutrition, and this will inſenſibly lead to the conſideration of the ſyſtem of veſſels above-mentioned.

Nutrition then is without doubt performed by means of the arteries*, which have two terminations; the one a correſpondent vein, and the other a ſecerning extremity. Now for the nouriſhment of the body, the arteries are continually dropping the principles of nouriſhment from their open extremities, and the inſtant new particles are depoſited, the old ones muſt be taken away. The ſyſtem of veſſels taking away this matter, are called the lymphatic abſorbent ſyſtem, and have open extremities like the arteries, though not an immediate communication with them; and whoever conſiders but a few moments how putrid miaſmata or even medicines get into the blood, muſt inſtantly allow the exiſtence of them; nay, one cannot reflect but with aſtoniſhment, upon the wonderful power of theſe veſſels in the abſorption of air, blood, bone, &c. of which we have a ſtriking inſtance in the removal of the cryſtalline lens, when depreſſed, and thereby rendered uſeleſs. They are ſuppoſed to be in every point of us: Spread upon the inteſtines and meſentery, they are called lacteals, and lymphatic abſorbents in other parts; and nutrition is poſſibly performed in this way, viz. the inſtant the freſh particle is dropt, the old one is puſhed forward, and imbibed by the open extremity of an abſorbent veſſel, and thus nutrition and abſorption go hand in hand; and as the old particles may be ſuppoſed in ſome degree to become putrid before they are taken away, if abſorption does not equal the depoſition,

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* There are ſome arteries nouriſhing various parts of the body, which do not carry red blood, and theſe have been confounded with the above ſyſtem of veſſels, though in fact they are very different from them.

tion, you ſoon have diſeaſe affecting the whole ſyſtem.

It appears from the experiments of Drs. Prieſtly and Ingenhouſe, that theſe veſſels are conſtantly abſorbing atmoſpheric air, as neceſſary to our health; and, indeed, we have reaſon to think ſo from the indifferent health of thoſe people whoſe ſkins are ſo dirty as to prevent the admiſſion of it.

Where there is no excretory duct the fluid is carried immediately into the blood by this ſyſtem of veſſels, and if an excretory duct is obſtructed, they will perform its office, of which an obſtructed liver, and the conſequent jaundice afford a ſufficient proof. But they will alſo often hinder any thing improper or hurtful from entering the circulation, and thus they are a kind of examiners; and as ſoon as every part has done its duty, they ultimately hand it out of the ſyſtem by the ſeveral emunctories.

The lymphatics all terminate in the venal ſyſtem, as is evident in many parts of the body, and therefore in conſidering them as appendices to the veins, we may ſay that veins abſorb ; and perhaps if you were to inflate them, you would inflate the whole venal ſyſtem ; and the arterial ſyſtem may be ſaid to be always endeavouring to regulate and accompany the abſorbents in their progreſs. Theſe veſſels are always upon the watch to regulate according to neceſſity, that is, according to the quantity of fluid depoſited. Every ſecretion and excretion is regulated by means of them ; in ſhort, there is no proceſs in the human body which can be carried on without them, and to know how to encreaſe the power and action of theſe veſſels, has been too much neglected hitherto ; though from the very great attention paid to them of late by Cruikſhank and others, it is hoped, that theſe complaints will ſoon be done away.

In a healthy ſound ſtate of body, the diſpoſition to abſorption is not ſo great by far, as in a weak and relaxed habit ; and this verifies the opinion of the ancients, who laid it down as a phyſical maxim, that when poiſonous effluvia was in the air, if the ſyſtem was ſtrong and vigorous, ſuch perſons would eſcape infection much more than thoſe of a contrary habit.

The abſorbents therefore may juſtly be ſaid to keep the balance between the ſolids and fluids, (whereby they preſerve the equilibrium of health) which balance is diſcovered by the Pulſe; and therefore no wonder that the Pulſe is always an object of ſo much attention.

Dr. Heberden* has enumerated the Pulſes of children at different ages; as for inſtance, "that of an infant in the firſt year, between 100 and 120 in a minute; during the ſecond, from 90 to 100; and the third, from 80 to 108, and nearly the ſame for the 4th, 5th, and 6th. In the ſeventh year, he ſays, the pulſations will ſometimes be ſo few as 72, though generally more; and in the 12th year, in healthy children, they will often be no more than 70; and, therefore, except only that they are much ſooner quickened by illneſs, or any other cauſe, they will differ but little after that from the healthy Pulſe of an adult, the range of which is from a little below 60, to a little above 80. It muſt be remembered, that the Pulſe becomes more frequent, by 10 or 12 in a minute, after a full meal. If the Pulſe, either of a child or an adult, be quickened ſo as to exceed the utmoſt healthy limit, by 10 in a minute, it is an indication of diſorder; but a child is ſo irritable, that during the firſt year a very ſlight fever will make the artery beat 140, nay, even 160, without danger; and as there then begins to be ſome difficulty in counting, the concomitant ſymptoms will enable us to form the beſt opinion. If the Pulſe of a child ſinks ſpeedily 15 or 20 below the loweſt limit of the natural ſtandard point, it is much more alarming than if it riſes ſo many above, becauſe it indicates an affection of the brain; but there are many exceptions to any general rule, and it is true that the Pulſes of ſome people have been irregular in health, and regular only in diſeaſe. As to intermitting Pulſes, they are not uncommon in health; and even in diſeaſe, if they are not joined with other bad ſigns of more conſequence, they are not always ſo alarming as has been ſuppoſed."

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* In a paper read at the College of Phyſicians, Ann. Dom. 1768.

"The Pulſes of women will ſometimes exceed what has been mentioned as the higheſt limit of the healthy ſtandard, and ſometimes, though more rarely, thoſe of men; but the Pulſes of men afford more exceptions in falling ſhort of the loweſt."

"There are very few healthy men whoſe Pulſes are more than 90; and the Doctor ſays, he knew one, whoſe chief diſtemper was the age of 80, in whom, for the laſt two years of his life, he only once counted ſo many as 42, but they were ſeldom above 30, and ſometimes not more than 26; and though he ſeemed heavy and torpid, yet he could take exerciſe, receive company, and enjoyed a tolerable good appetite."

According to Haller's opinion*, "the Pulſe of a healthy perſon riſing in the morning beats 65 in a minute, but after the fatigue of the day, it will beat 80 in that time; and by the night's reſt or ſleep, it will become gradually leſs frequent, till in the morning you will find it returned to its primitive number of 65. For the motions of the muſcles, and actions of the external and internal ſenſes, the warmth of the atmoſphere, and the action of the aliments taken into the ſtomach urge on the venal blood to the heart, which being thereby oftener ſtimulated, makes more frequent contractions. Indeed, all muſcular preſſure upon the veins muſt be entirely employed in accelerating the return of the blood to the heart; hence, that wonderful quickneſs of the Pulſe, heat and redneſs of the body, with ſhort and laborious breathing that attends muſcular action or laborious exerciſes, which, together with the reſiſtance in the lungs to its re-entering the arteries, produces an over-proportion of blood in the ſame, and hence the difficulty of reſpiration in aſthmatic people."

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* Vol. 1ſt. Chap. vii. Pag. 99.

" A feveriſh Pulſe begins at 96, and we think the Pulſe has but a moderate celerity in fevers, or laborious exerciſes of adult perſons, if it does not exceed 110, or 120 in a minute; but it is exceſſive at 130 or 140, with which number of people ſeldom recover, nor does it often exceed that number."

" The Pulſe beats ſlower in winter, and quicker in ſummer, by about 10 ſtrokes in a minute, and under the torrid zone it grows quicker to 120."

From theſe obſervations then it appears, that although the Pulſe is in many caſes an uſeful index of the ſtate of our health, yet it is by no means a certain one in all, and therefore ſhould never have too much influence upon a medical opinion; becauſe, without a due regard to other circumſtances, it may tend very much to miſlead us. If therefore it ſhould continue to be the firſt ſubject of enquiry, I would earneſtly recommend that it may always be the *laſt* *.

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* In Dr. Ruſſell's Natural Hiſtory of Aleppo, ſpeaking of his viſit to the Harem, he ſays, the native practitioners give a ſanction to a fooliſh notion that the malady may be diſcovered by the Pulſe; but I always followed the example of my brother in that reſpect, who (except in fevers) always inſiſted on the ſick giving an account of their complaints to him before he would feel their Pulſe.

TWO CASES OF NATURAL SMALL-POX DURING PREGNANCY.

It always has been, and I ſuppoſe ever will be allowed, that all diſeaſes, eſpecially if acute, are much more dangerous during pregnancy than at any other period of life; it has therefore generally been thought neceſſary to remove a pregnant woman out of the way of the ſmall-pox, and therefore it can be no wonder if the certain effects of the ſmall-pox upon the fœtus in utero are not generally known.

The following caſes are therefore related with a view of aſſiſting to remove a degree of uncertainty that ſeems to remain with reſpect to the effects of the ſmall-pox upon the fœtus in utero, which I am tempted to relate, from having lately met with the hiſtory of a caſe in the beginning of Dr. Duncan's Medical Commentaries for the year 1794, to which there are annexed ſeveral myſterious conjectures, e. g. The Dr. ſays, he thinks that there is not, "perhaps, a ſingle deciſive inſtance of a patient going through the diſeaſe in the womb, and being afterwards born alive; and that it is not even clearly proved that a child born with the ſmall-pox has ſurvived this diſeaſe."

How far the medical world in general are agreed upon this ſubject, I cannot pretend to judge; but if there is ſuch a caſe wanting to prove the poſſibility of the thing, perhaps the following may be worth acceptance, viz.

CASE I.

On the 28th of April, 1796, Mary Beckenham, of Sutton Courtney, in the County of Berks, was attacked with thoſe ſymptoms which uſually precede an eruptive fever; and the natural ſmall-pox being then in the village, it was juſtly ſuſpected that ſhe was infected with that diſeaſe; and accordingly in the ſpace of a few days, an eruption made its appearance, which from the attendant ſymptoms during the progreſs of the diſeaſe, the regular ſuppuration of the Puſtules, the ſubſequent infection of the reſt of the family, and the marks remaining after her recovery, there could be no doubt of its being the confluent ſmall-pox.

When firſt taken ill, ſhe was ſuppoſed to be about four months advanced in pregnancy; and from the great confluence of the Puſtules, and the violence of the ſymptoms, it was hardly expected that ſhe could eſcape with her life; however, ſhe happily recovered, and on the 26th of July following was ſafely delivered, with very little of my aſſiſtance, of a live male child, bearing very *diſtinct* marks of its having been affected with the ſame diſeaſe as that of the mother. Now from the ulcerated ſpots being completely cicatrized, as well as the diſtance of time from the firſt infection of the mother, I think I may venture to conclude, that this patient had paſſed through the diſeaſe in utero, and ſurvived it, ſo far at leaſt; however, from the ſize of the child, which was rather below mediocrity, the diſtance of time from a certain affection of the mother, and the death of the child in leſs than half an hour after its birth*, I did alſo conclude that the mother could not be much more than ſeven months gone, and that at any rate the child could not be ſaid to have paſſed through the diſeaſe with impunity.

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* This child is preſerved by Dr. Pegge, in the Anatomical Muſeum at Oxford.

CASE II.

Ann Puſey, of Abingdon, Berks, was advanced in pregnancy about four months, when a general inoculation took place through the town; ſhe was accordingly adviſed to remove till after her delivery, but from the preſſing neceſſities of her own family, who were alſo under inoculation, and many more very urgent reaſons, ſhe was obliged to remain, and choſe to run all riſque rather than be inoculated; ſhe was, however, prepared as for inoculation, and caught the diſeaſe, which ſhe paſſed through very favourably, having but a moderate ſprinkling, and at the period of cuſtomary calculation, was ſafely delivered of a daughter, without the leaſt appearance of the child ever having been infected with the diſeaſe of the mother.—

The child is now ſeven years of age, and I hope ſoon to have the pleaſure of inoculating her, for the ſatisfaction of all concerned.

Dr. Duncan further concludes, "that the fœtus is not affected by the variolous matter that infects the mother, and that it is never infected but by variolous matter generated by the mother," by which I underſtand that he doubts the poſſibility of the fœtus being ever infected by the mother, when ſhe is under inoculation. This certainly may be doubted for ought I know to the contrary; but if this ſhould be aſſerted as an eſtabliſhed fact, it would ſeem a very difficult matter to account for the loſs of ſo many children by miſcarriage, that it has generally been expected as a matter of certainty after the earlier months of pregnancy, and therefore inoculation has generally been carefully avoided under thoſe circumſtances.

Now the loſs of the child has been imputed to ſeveral cauſes. The effect of mercury during the preparation of the mother, has been conſidered ſufficient by ſome; but this I very much doubt, becauſe it is well known that we often puſh the uſe of mercury with much more freedom than is requiſite in the ſmall-pox; in another diſeaſe (the effect of local infection) with ſafety to the mother, and without deſtroying the child, not to ſay, preſerving it thereby.

Dr. Duncan's conjectures upon the circumſtances on which this fatality depends are certainly ingenious, but perhaps may be doubted by ſome. He ſuppoſes them to be the following, viz.

1ſt. The fœtus being immerſed in a liquid.

2d. The ſmall quantity of oxygen taken into the conſtitution, and that only through the intervention of the mother.

3d. The temperature of the ſurrounding medium of ſolids and fluids being 97 or 98°.

Now before we can eſtabliſh the ſecond poſition as a matter of certainty, I think it will firſt of all be neceſſary to enquire how far an abundance of oxygen is required to ſupport an eruptive diſeaſe, during the proceſs of ſuppuration; and then to learn the exact difference between the Pulſe of the fœtus in utero, where there is no reſpiration, and in all probability but a ſmall quantity of oxygen taken into the conſtitution, and that of the new-born child, when the blood is fully oxygenated in its paſſage through the lungs, which, from the few obſervations which I have been able to make, I believe to differ.

However, this laſt may be proved to a certainty, either in an arm or a footling caſe; and as to the firſt, I beg leave to obſerve, that this particular ſubject has but juſt excited my attention, and I only offer the above as ſimple naked facts; declaring in the mean time, that I mean to make it an immediate ſubject of enquiry, and as ſoon as I feel myſelf provided with ſufficient information on the ſubject, I hope it will be in my power to leſſen the myſtery that certainly attends it at preſent.

FINIS.

ERRATA.

Page 3, line 17, for culumn, read *column.*
10, 4, for pulſus durus, read *pulſus ſtabilis.*
14, 12, for appetites, read *appetite.*
26, 18, omitted, becauſe *glaſs will bear a degree of cold below* 0° *without injury, and* the ſame glaſs, if gradually heated, (in balneo arenæ) would bear heat enough to boil any fluid.